REMARKS

Upon entry of the foregoing amendments claims 1, 5-15, 18-20, and 27-33 are pending in the application. Claims 3, 4, 16, and 17 have been cancelled without prejudice or disclaimer to the subject matter contained therein. Claims 27-33 are newly added.

Claim 1 has been amended to clarify the inventive subject matter. Basis for the amendment can be found throughout the specification and claims as originally filed, for example, at paragraph 16 of the published application.

The Applicant's thank the Examiner for the indication that the subject matter of claim 17 is allowable, if rewritten to include the limitations of the base claim and intervening claims. Pursuant to the Examiner's suggestion the subject matter of claim 17 has been rewritten and incorporated into amended independent claim 15. Support for amended claim 15 can be found at, for example, previous claims 1, and 15-17, and at paragraph 30 of the published application. As such, the claims 18 and 19 have been amended to depend amended claim 15.

Claims 7-9, 13, 15, 19 and 20 have been amended to clarify the inventive subject matter recited therein.

New claims 27-33 have been added to recite the subject matter previously claimed in claims 7-9, 13, and 19.

Accordingly, the amendments do not introduce any new subject matter within the meaning of 35 U.S.C. § 132. Therefore entry of the amendments is respectfully requested.

REJECTION UNDER 35 U.S.C. §112, second paragraph

At page 2 of the Official Action the Examiner rejects claims 7-9, 13, 15, 19, and 20 as being indefinite under 35 U.S.C. § 112, second paragraph.

Applicants respectfully traverse this rejection. The Examiner asserts that, in a single claim, a broad range or limitation together with a narrow range or limitation that falls within the broad range is indefinite.

Claims 7-9, 13, 15, 19, and 20 have all been amended to recite only one range. Newly added claims 27-33 now recite the more narrow ranges previously recited in claims 7-9, 13, and 19. Claims 15 and 20 have been amended to recite alternatives. As amended, claims 7-9, 13, 15, and 20 are definite within the meaning of 35 U.S.C. § 112, second paragraph.

Accordingly, Applicants respectfully ask that the Examiner reconsider and withdraw this rejection.

REJECTIONS UNDER 35 U.S.C. §103(a)

Claims 1-15 and 20 have been rejected under 35 U.S.C. § 103(a) as being anticipated by Mulvaney, et al. (U.S. Patent No. 6,548,168) in view of Oldenburg, et al. (U.S. Patent No. 6,344,272).

Also claims 16 and 18-19 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Mulvaney, et al.

in view of Oldenburg, et al. in further view of West (U.S. Patent No. 6,428,811). Applicants respectfully traverse this rejection.

The U.S. Supreme Court in Graham v. John Deere Co., 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. *See* Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

Applicants respectfully traverse all of the instant rejections under 35 U.S.C. 103(a), because the cited references, alone or in combination, fail to teach each and every limitation of the presently claimed subject matter.

Mulvaney, et al. in view of Oldenburg, et al.

Claim 1 of the instant application recites an antimicrobial polymeric coating composition, in particular an antimicrobial coating material, comprising inorganic core-shell particles having a core and at least one shell directly deposited thereon, wherein the core comprises nanoscale particles selected from the group consisting of aluminum oxide, zirconium oxide, titanium oxide, iron oxide, cerium oxide, indium-tin oxide, silicon carbide, tungsten carbide and silicon nitride, having a particle size <100 nm, and the shell is formed by at least one metal having an antimicrobial action. The core-shell particles of claim 1 do not contain any organic parts, i.e., there is no organic shell of linker molecules.

Mulvaney, et al. and Oldenburg, et al., when considered alone or in combination, fail to teach or suggest a coating with core-shell particles free of organic parts. Further, when considered alone or in combination, Mulvaney, et al. and Oldenburg, et al., fail to teach or suggest core-shell particles having a core comprising nanoscale particles selected from the group consisting of aluminum oxide, zirconium oxide, titanium oxide, iron oxide, cerium oxide, indium-tin oxide, silicon carbide, tungsten carbide and silicon nitride.

Mulvaney, et al. do not teach or suggest a coating with core-shell particles free of organic parts and having a core comprising nanoscale particles selected from the group consisting of aluminum oxide, zirconium oxide, titanium oxide, iron oxide, cerium oxide, indium-tin oxide, silicon carbide, tungsten carbide and silicon nitride. In fact, the core shell particles taught by Mulvaney, et al. comprise core particles, which may comprise a metal, such as copper, silver, gold, or platinum; a metal compound, such as metallic sulfide, metallic halide, etc.; or a semiconductor nanoparticle such as cadmium sulfide, germanium, zinc sulfide, etc. See, for example, claims 3-8. The shell, or "coating layer", is selected from silica; an organic conducting polymer; a metal, such as platinum, palladium, iridium, bismuth, copper, silver, gold, and mixtures thereof; a metal oxide; a metal sulfide; a metal selenide; a metal telluride; and a metal halide. See, for example, claims 13-20.

Oldenburg, et al. fail to cure the deficiencies of Mulvaney, et al., because Oldenburg, et al. do not teach or suggest a coating with core-shell particles free of organic parts and having a core comprising nanoscale particles selected from the group consisting of aluminum oxide, zirconium oxide, titanium oxide, iron oxide, cerium oxide, indium-tin oxide, silicon carbide, tungsten carbide and silicon nitride, as recited in present claim 1. Rather, the core shell particles described by Oldenburg, et al. comprise a nonconducting core (layer) and a conducting shell layer. See, for example, claim 1. The conducting

shell layer may comprise a metal selected from coinage metals, noble metals, transition metals, synthetic metals, an organic conducting material or metal alloy. See, for example, claims 2-5. The core of Oldenburg, et al. comprises a dielectric or semiconducting material, such as silicon dioxide, titanium dioxide, PMMA etc. or mixtures thereof. See, for example, claims 7-11.

Additionally, according to claim 1, the core-shell particles have a metal shell directly deposited on a core layer. Mulvaney, et al. and Oldenburg, et al., when considered alone or in combination, fail to teach core-shell particles having a metal shell directly deposited on a core layer.

In contrast to the present invention, both Mulvaney, et al. and Oldenburg, et al. require the presence of linker molecules as mandatory for use as a "bonding layer" between the core and the shell.

Mulvaney, et al. do not teach or suggest core-shell particles having a metal shell directly deposited on a core layer. Mulvaney, et al., as shown in Examples II-V, describe the synthesis of the core particles. In a second step, a layer of linker molecules is attached to the core followed by the attachment of metal clusters as "seed" colloids to the free end of the linker molecules. The final growth of the shell can then take place via the enlargement of the clusters attached to the linker molecules as seed colloids.

Oldenburg, et al. fail to cure the deficiencies of Mulvaney, et al., because Oldenburg, et al. do not teach or suggest core-shell particles having a metal shell directly deposited on a core layer. In fact, the coreshell particles disclosed in Oldenburg, et al. require particles with at least two layers. The innermost layer is said to be a core. A layer that surrounds the core is said to be a shell layer. *See* Oldenburg, et al. at column 4, line 63 through column 5, line 40. According to column 6, lines 23-25 of Oldenburg, et al., the "unique chemical methods" used to produce the composition of Oldenburg, et al. are restricted to the use of linker molecules between the core and the shell layer. A number of the embodiments disclosed in Oldenburg, et al. further describe the use of linker molecules. *See* Oldenburg, et al., for example, column 6, line 23 through column 8, line 14. In particular, Example IV of Oldenburg et al. expressly states that "[m]etal clusters were attached to the linker molecules on the core…." *Emphasis added.*

As discussed in the Amendment and Response filed on November 28, 2005, responsive to the Official Action dated June 27, 2006, the core-shell particles of Oldenburg, et al. are synthesized similarly to the method described above in Mulvaney, et al. See, for example, claims 1 and 2. Core particles are provided together with a bifunctional ligand, represented by the formula A-X-B to provide a core particle ligand admixture. The first functional group, A, is capable of binding specifically to the core particle and therefore alters the surface state of the particle. The second functional group, B, activates the core particle for

nucleation of a coating layer. X is a linking group. In a subsequent step, the mixture of the core particle and the ligand is added to a source of coating and the bifunctional ligand and coating are allowed to deposit upon the particle. Alternatively, a source of the core particle maybe admixed with a source of coating to provide a core particle coating admixture to which the bifunctional ligand is added. According to the general procedure described in the example, the formation of the coating can take up to a few days, for example five days in the case of the deposition of silica on CdS particles. See, col. 9, lines 3-6.

Additionally, according to claim 1 of the instant application, the composition is an antimicrobial polymeric coating composition, in particular an antimicrobial coating material. Mulvaney, et al. and Oldenburg, et al., when considered alone or in combination, fail to teach an antimicrobial polymeric coating composition, in particular an antimicrobial coating material.

Mulvaney, et al. fail to teach or suggest an antimicrobial polymeric coating composition, in particular an antimicrobial coating material. In fact, Mulvaney, et al. only discloses the use of stabilized pigments "in the fields of pigments, paints, fabrics and optics such as fluorescence and electronics."

Oldenburg, et al. fail to cure the deficiencies of Mulvaney, et al., because Oldenburg, et al. do not teach or suggest an antimicrobial polymeric coating composition, in

particular an antimicrobial coating material. To the contrary, none of the applications disclosed by Oldenburg, et al. teach or suggest an antimicrobial polymeric coating composition, in particular an antimicrobial coating material. *See* Oldenburg, et al. column 4, lines 39-62.

Moreover, the structure and nature of the particles of Mulvaney, et al. and Oldenburg, et al. are clearly different from the particles of the present invention.

For example, during the preparation of the core shell particles of the present invention, the particles are preferably calcined. Therefore, the core shell particles of the present invention are heated to the point of a certain degree of decomposition, with the water of crystallization present in the materials being at least partly or, preferably, completely removed. *See* paragraph 31 of the presently published application. In contrast, particles having an organic shell of linker molecules, specifically those which are partly organic like the ones described by Mulvaney, et al. and Oldenburg, et al. would not stand such a heat treatment. Therefore, the disclosure of Mulvaney, et al. and Oldenburg, et al. actually teaches away from the present invention.

Finally, the coatings according to the present invention are easily prepared. The coating of core particles is accomplished within a few minutes. Specifically, a coating thickness of 1 nm can be achieved in about 10 minutes. See, for example, paragraphs 39-44 of the published application. The core shell particles

obtained in this way are provided in the form of a thick aqueous paste, which can be directly incorporated by stirring, e.g., into an acrylic coating material, providing a coating material with outstanding antimicrobial properties. See, for example, paragraphs 45-46 of the published application.

In contrast, the core shell particles according to Mulvaney, et al. and Oldenburg, et al. would be comparatively difficult to produce, because their preparation requires the additional step of applying a layer of linker molecules. As a result, particles according to these references would also be expensive and time consuming to produce.

In view of the foregoing, it is submitted that nothing in Mulvaney, et al. and Oldenburg, et al., taken alone or together, renders the claimed invention obvious within the meaning of 35 USC § 103(a). Applicants respectfully submit that a *prima facie* case for obviousness has not been established. Accordingly, the Examiner is respectfully requested to withdraw this rejection.

Mulvaney, et al. in view of Oldenburg, et al. in further view of West

As discussed above, claim 16 has been cancelled. As amended, dependent claims 18 and 19 depend from claim 15. Therefore, this rejection has been obviated.

Applicants respectfully requests that the Examiner reconsider and withdraw this rejection.

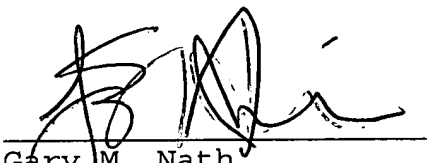
Conclusion

In view of the foregoing, Applicants submit that the application is in condition for allowance. The Examiner is invited to contact the undersigned attorney if it is believed that such contact will expedite the prosecution of the application.

Please charge any fee deficiency or credit any overpayment to Deposit Account No. 14-0112.

Respectfully submitted,

NATH & ASSOCIATES PLLC



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